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REMARKS

Claims 18-23 and 25-26 are pending in the application.

Claim 18 has been amended to more particularly point out and distinctly claim that which Applicants regard as their invention to recite an unagglomerated distribution of finely sized ceramic phase particles having an average particle diameter of less than about 0.3 microns formed and dispersed in-situ in an aluminum metal matrix.

Support for the Amendment is found on page 7, lines 6-8, of Applicants' specification as originally filed.

Claim 26 has been added to more particularly point out and distinctly claim that which Applicants regard as their invention to recite a cluster-free distribution of no more than two particles attached to one another at a magnification of 500x having an average particle diameter of less than about 0.3 microns formed and dispersed in-situ in an aluminum metal matrix of aluminum.

Support for the Amendment is found on page 12, lines 9-13, of Applicants' specification as originally filed.

Claims 18, 20-23, and 25 stand newly rejected under 35 U.S.C. 103 as being unpatentable over Nagle.

A new ground of rejection of Claims 18, 20-23, and 25 was entered in the Decision on Appeal. This Amendment responds to the new ground of rejection under 37 C.F.R. 1.196(b).

37 C.F.R. 1.196(b) provides, "A new ground of rejection shall not be considered final for purposes of judicial review."

37 C.F.R. 1.196(b) also provides that the appellant, within two months from the date of the decision may exercise the following option with respect to the new ground of rejection to avoid termination of proceedings (37 C.F.R. 1.197(c)) as to the rejected claims:

(1) Submit an appropriate amendment of the claims so rejected or a showing of facts relating to the claims so rejected, or both, and have the matter reconsidered by the Examiner, in which event the application will be remanded to the Examiner.

Claims 18, 20-23, and 25 stand newly rejected under 35 U.S.C. 103 as being unpatentable over Nagle.

Nagle discloses a method for the production of a composite comprising a distribution of second phase particles in a metal, metal alloy, or inter-metallic final matrix.

Applicants' claims as amended require a uniform unagglomerated distribution of finely sized metal carbide particles selected from the group consisting of Sc, Hf, Nb, Mo, and V

finely sized metal carbide particles. These metal carbides are not taught or suggested by Nagle.

Applicants' invention provides a novel liquid-state dispersoid-forming process, novel ceramic particle dispersoids formed in-situ in metal by the liquid-state process, and novel products containing the ceramic particle dispersoids formed in-situ in metal by the liquid-state process. Applicants' invention as claimed, as amended, provides a novel product for producing a material containing uniformly dispersed, finely sized ceramic phase particles, e.g., such as Sc, Hf, Nb, Mo, and V carbide particles, formed in-situ in metal by a novel liquid-state dispersoid-forming process.

Applicants' invention as claimed, as amended, provides a novel liquid-state-in-situ-formed ceramic dispersoid in metal product produced by the process of providing a molten composition of molten aluminum metal / alloy and molten Ti metal, wherein the Sc, Hf, Nb, Mo, and V metal is provided in molten composition Sc, Hf, Nb, Mo, and V as a liquid and not as a powder.

The significant difference of liquid and not powder is important to bring the components of titanium and carbon to reactive contact in the liquid state in the process of the present invention. A high density uniform unagglomerated dispersion of

very small dispersoid particles is provided by the final product of Applicants' invention.

The product of Applicants' invention is very dense, e.g., on the order of 98% to 99% or higher. Porosity is undesirable in the product of Applicants' invention as claimed, as amended. The importance of the high density, essentially non-porous product produced in accordance with Applicants' claims, as amended, is found in providing a porosity-free material for producing aluminum castings.

The Nagle reference discloses a Direct Addition Process which adds a powder of titanium, e.g., a compact, to aluminum as molten aluminum and powder aluminum. See Nagle Examples 1-5, col. 16-17.

The Nagle additives are added as a separate phase, i.e., in a solid phase powder different from the molten phase of the matrix.

The Nagle process is highly exothermic and difficult to control.

Applicants' invention requires a product formed by providing a molten composition of aluminum metal liquid and metal liquid, wherein Sc, Hf, Nb, Mo, and V metal liquid is provided in the molten composition as a liquid and not as a powder.

Accordingly, the Nagle et al. Direct Addition Process of adding Ti powders is significantly different from Applicants' Claims which require a unique product available only from a liquid state process wherein the Sc, Hf, Nb, Mo, and V metal liquid provided in the molten composition as a liquid and not as a powder.

The significant difference of liquid and not powder is important to bring the components of Sc, Hf, Nb, Mo, and V and carbon into an intimate reactive contact in the liquid state as set forth in Applicants' specification.

Applicants' ceramic phase titanium carbide particles have an average particle diameter of less than about 0.3 micron formed and dispersed in situ in the final aluminum metal matrix, which is nowhere taught or suggested by Nagle.

For the foregoing reasons, the new rejection of Claims 18, 20-23 and 25 under 35 U.S.C. §103 as unpatentable over Nagle is believed to have been overcome and is respectfully requested to be reversed.

New Claim 26 requires a ceramic dispersoid in metal product, comprising a matrix metal of aluminum and a uniform cluster-free distribution of no more than two particles attached to one another at a magnification of 500x having an average particle size of less than about 0.3 microns, said finely sized metal

carbide particles selected from the group consisting of Sc, Hf, Nb, Mo, and V and said finely sized metal carbide particles formed and dispersed in-situ in said metal matrix.

Nagle does not teach a uniform cluster-free distribution of no more than two particles attached to one another at a magnification of 500X. The importance of the difference is found in the fact that although conventional ceramic phase formation processes in metal may offer some possibilities for the production of a wide range of reinforcement particle types and improved compatibility between the reinforcement and the matrix, the in-situ formed ceramic particles in metal are too large, e.g., on the order of several microns, and are found to form clusters. In-situ formed ceramic particles having these sizes, i.e., of several microns, are candidates for use as reinforcement in a composite, but are not suitable for use as dispersoids for recrystallation control, for dispersion strengthening, or for use as a component for structure refinement. Applicants have found, on the other hand, that the novel ceramic dispersoid in metal product of the present invention provides a uniformly dispersed product of finely sized ceramic phase particles dispersed in-situ in a metal matrix having a uniform cluster-free distribution of no more than two particles attached to one another at a magnification of 500X.

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The uniform cluster-free distribution of no more than two particles attached to one another at a magnification of 500x is shown in Figure 2, and discussed at page 12, of Applicants' specification as originally filed.

Attached hereto is a marked-up version of the changes made to the case by the current Amendment. The attached pages are captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

Reconsideration of this application is requested.

Respectfully submitted,

Douglas G. Glantz
Attorney for Applicants
Reg. No. 29,640

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Douglas G. Glantz
Attorney At Law
5260 Deborah Court
Doylestown, PA 18901
Voice: (215) 794-9775
Fax: (215) 794-8860
DGG/mnr

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

18. (Three Times Amended) A ceramic dispersoid in metal product, comprising:

(a) a matrix metal of aluminum and

(b) a uniform unagglomerated distribution of finely sized metal carbide particles having an average particle size of less than about 0.3 microns, said finely sized metal carbide particles selected from the group consisting of Sc, Hf, Nb, Mo, and V and said finely sized metal carbide particles formed and dispersed in-situ in said metal matrix.

26. A ceramic dispersoid in metal product, comprising:

(a) a matrix metal of aluminum and

(b) a uniform cluster-free distribution of no more than two particles attached to one another at a magnification of 500x having an average particle size of less than about 0.3 microns, said finely sized metal carbide particles selected from the group consisting of Sc, Hf, Nb, Mo, and V and said finely sized metal carbide particles formed and dispersed in-situ in said metal matrix of aluminum.